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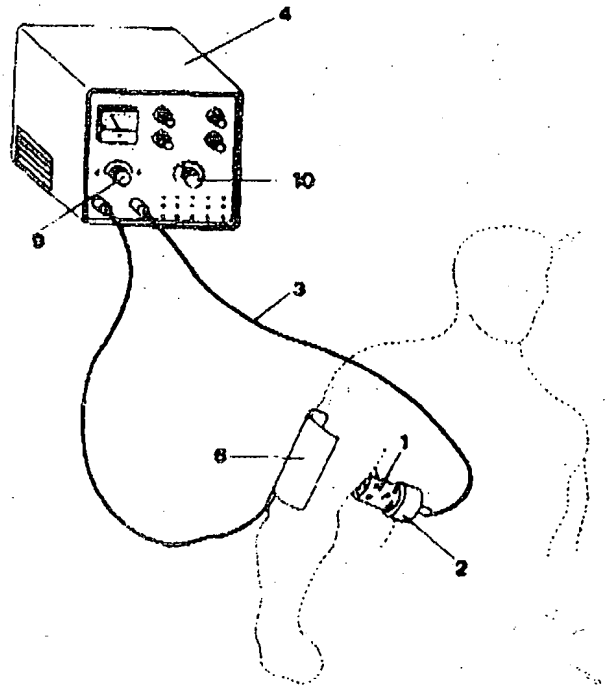
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With international search report.

(54) Title: A DEVICE FOR IONOPHORESIS PHYSIOTHERAPY WITH FROZEN MEDICAMENT CRYSTALS

(57) Abstract

The device for physiotherapy according to the present invention comprises an electric current generator (4) with variable and in case modulated frequency, supplied between two electrodes that comprise the sick anatomic part to be treated, the first electrode consisting of a container (2,5) for a medicament solution in distillate water brought to the freezing point, and the other one in an element (6) with a wide surface that may be applied to the skin for closing the electric circuit, by means of the passage of the current through the anatomic part, consisting of the flow of ions coming from the frozen medicament crystals, so that nearly the whole of said ions penetrate through the anatomic part being treated, directly reaching the activity areas.



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penetrate through the anatomic part being treated, directly reaching the activity areas.

The advantages of the device according to the present invention are many and considerable:

- the electrode with the frozen medicament crystal ions may be connected, by means of a contact provided in the container, to the cathode as well as to the anode, according to the polarity of the ions;
- the lubrication caused by the progressive melting of the medicament ice on the skin allows the circulation of a current intensity higher than the one of the conventional ionophoresis, without causing burns or other;
- the medicament can be exactly dosed and in a constant quantity for the whole treatment, as all ions and only those present in the crystal are translated into the electric current, while the pure melted solvent will be collected while running down the skin;
- because of the lubrication due to the manual massage performed by the operator onto the skin with the ionic frozen crystal, any Ph-value alteration of the skin is prevented;

- the process may be applied also in presence of a laceration and contusion trauma, as no burn and/or abrasion occurs;
- an immediate analgesic effect takes place, as the medicament in ion-crystals is kept at a temperature of about -5°C during the treatment, making the ions penetrate in the deepest structures of the anatomic parts.

The device and the process according to the present invention may be applied to all cases of local treatment of pathologies that may be treated with active ions, and in particular in the following cases:

- scapular and humeral periartthritis;
- post-operating trauma and/or with intra-articular effusion of the knee;
- insertion trauma;
- tendinitis, inguinal tendinitis, coxo-arthritis, etc.;
- peripheral neurological syndrome.

The present invention will be described in detail hereinbelow with reference to the enclosed drawings in which a preferred embodiment is shown, and in which:

figure 1 shows, in an axonometric and transparency view, the container for the medicament in distillate water, with the internal contact for the electric connection;

figure 2 shows the structure of the electrode, consisting of the medicament frozen to ion crystals, without the upper part of the container;

figure 3 shows the electric and functional scheme of the complete device.

The figures show the device for ionophoresis physiotherapy with frozed medicament crystals, comprising:

- an electrode 1, positive or negative according to the sign of the ions into which the medicament in solution will dissociate, consisting of a container divided in a lower part 2, into which reaches the cable 3 of the electric generator, and an upper part 5, connected with a joint or in any other way, for increasing the capacity and for being removed, after the solidification of the ionic solution of the medicament in a low temperature ambient, so as to form a head for the emission of ions between 0°C and -5°C, and to be

- kept into contact, manually by the operator, on the patient's skin;
- an apparatus 4, generating periodical currents, triangular, sinusoidal or of other kind, single-phase or two-phase, in case modulated in width and/or in frequency, for supplying the energy for the transport of the frozen medicament ions on the head, in a close circuit;
 - an electrode 6 with a sign opposite to electrode 1, connected to apparatus 4, that provides for the passage of the ionic current through the anatomic part to be treated, consisting of an element with a wide surface that may be applied, with the interposition of gel or other electric contact means, onto the patient's skin.

The process for applying the device according to the present invention may be described as follows:

- the medicament is given into a solution, getting electrolytically ionized;
- the container is filled up, with the part 5, joint with the lower part 2 and provided with means 7, grooves or similar, for mechanically keeping the head emitting ions once the contained medicament is solidified in a freezer, and with a pin 8 or similar, projecting inside the lower part 2 for

establishing a good electric contact with the ion ice-block, forming said electrode 1;

- the upper part 5 of the container is removed, so as to uncover the frozen electrode 1;
- the anatomic part to be treated is shortly massaged with the frozen electrode head 1, for getting the patient used to the low temperature;
- electrode 6 is applied to a contraposed part of the body;
- switch 9 is pushed so as to determine the closing of the electric circuit of apparatus 4 as well as the passage of the local current, whereby in case the intensity of the current may be adjusted with knob 10;
- the frozen ionized medicament is kept at a temperature about -5°C , making the medicament penetrate into the deepest structures of the anatomic part treated.

CLAIMS

1. A device for ionophoresis physiotherapy with frozen medicament crystals, characterized in:
- an electrode (1), positive or negative according to the sign of the ions into which the medicament in solution will dissociate, consisting of a container divided in a lower part (2), into which reaches the cable (3) of the electric generator, and an upper part (5), connected with a joint or in any other way, for increasing the capacity and for being removed, after the solidification of the ionic solution of the medicament in a low temperature ambient, so as to form a head for the emission of ions between 0°C and -5°C, and to be kept into contact, manually by the operator, on the patient's skin;
 - an apparatus (4), generating periodical currents, triangular, sinusoidal or of other kind, single-phase or two-phase, in case modulated in width and/or in frequency, for supplying the energy for the transport of the frozen medicament ions on the head, in a close circuit;
 - an electrode (6) with a sign opposite to electrode (1), connected to apparatus (4), that provides for the passage of the ionic current through the a ... consisting of an

element with a wide surface that may be applied, with the interposition of gel or other electric contact means, onto the patient's skin.

2. A device according to claim 1, characterized in that said container is filled up with the medicament solution, with the part (3), joint with the lower part (2) and provided with means (7), grooves or similar, for mechanically keeping the head emitting ions once the contained medicament is solidified in a freezer, and with a pin (8) or similar, projecting inside the lower part (2) for establishing a good electric contact with the ion ice-block, forming said electrode (1).
3. A device according to claim 1, characterized in that the upper part (5) of the container is removed, so as to uncover the frozen electrode (1) that will be used manually during the treatment.
4. A device according to claim 1, characterized in the present of a knob (10) on the apparatus (4) for adjusting the electric current intensity.

INTERNATIONAL SEARCH REPORT

Int. App. No.
PCT/IT 95/00010

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61N1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELD'S SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61N A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 292 930 (DRUG DELIVERY SYSTEMS) 30 November 1988 see the whole document	1,3
A	WO,A,88 08729 (NEWMAN) 17 November 1988 see page 6, line 14 - page 9, line 11	1,4
A	FR,A,2 307 554 (LEGUELTE) 12 November 1976 see page 2, line 33 - line 38; figure 1	1,4
A	US,A,5 084 008 (MEDTRONIC) 28 January 1992 see column 5, line 53 - line 60	1,2

☐ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

4 October 1995

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
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Patent documents cited in search report	Publication date	Patent family member(s)	Publication date
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FR-A-2307884	12-11-76	NONE	
US-A-5084008	28-01-92	NONE	

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INTERNATIONAL SEARCH REPORT

Int. Application No.
PCT/IT 95/00010

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6: A61N1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELD(S) SEARCHED

Maximum documentation searched (classification system followed by classification symbols)
IPC 6 A61N A61B

Documentation searched other than maximum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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A	FR, A, 2 307 554 (LEGUELTE) 12 November 1976 see page 2, line 33 - line 38; figure 1	1, 4
A	US, A, 5 084 008 (MEDTRONIC) 28 January 1992 see column 5, line 53 - line 60	1, 2

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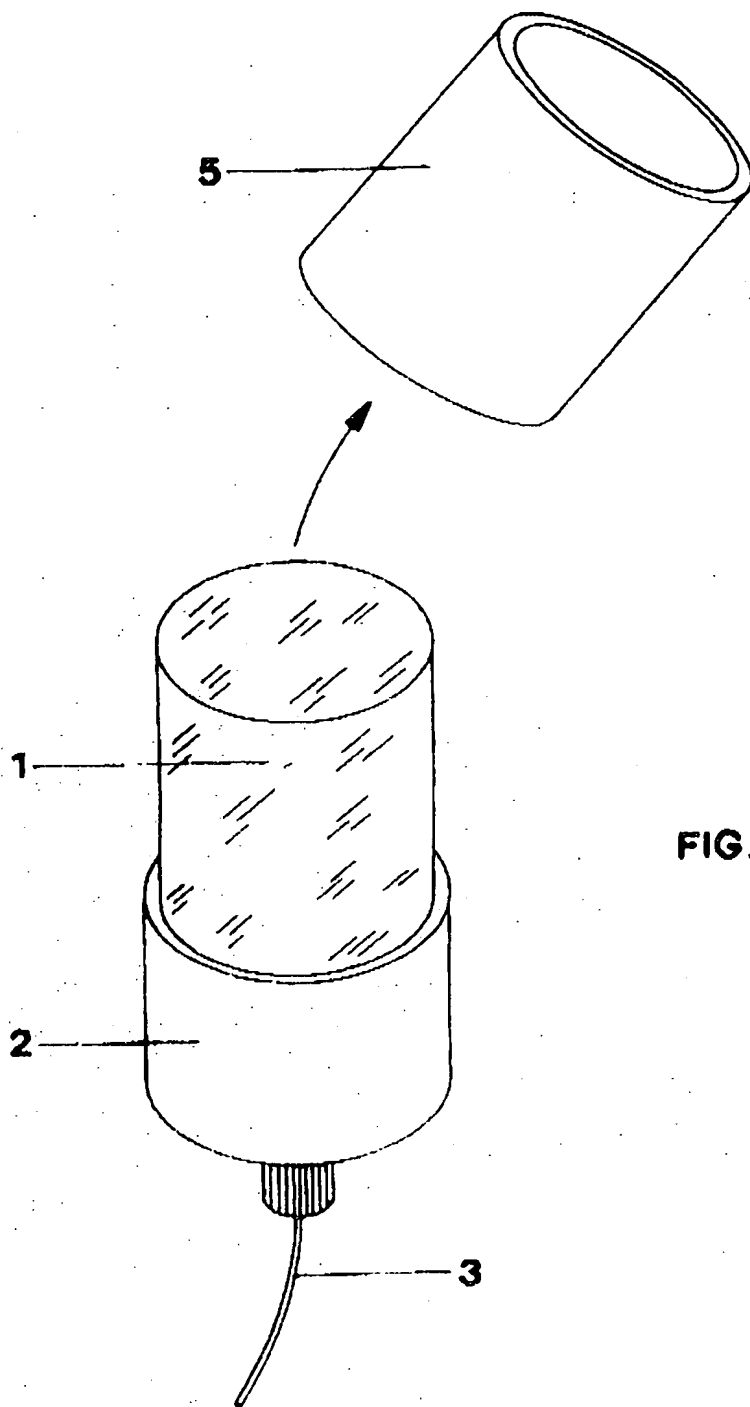
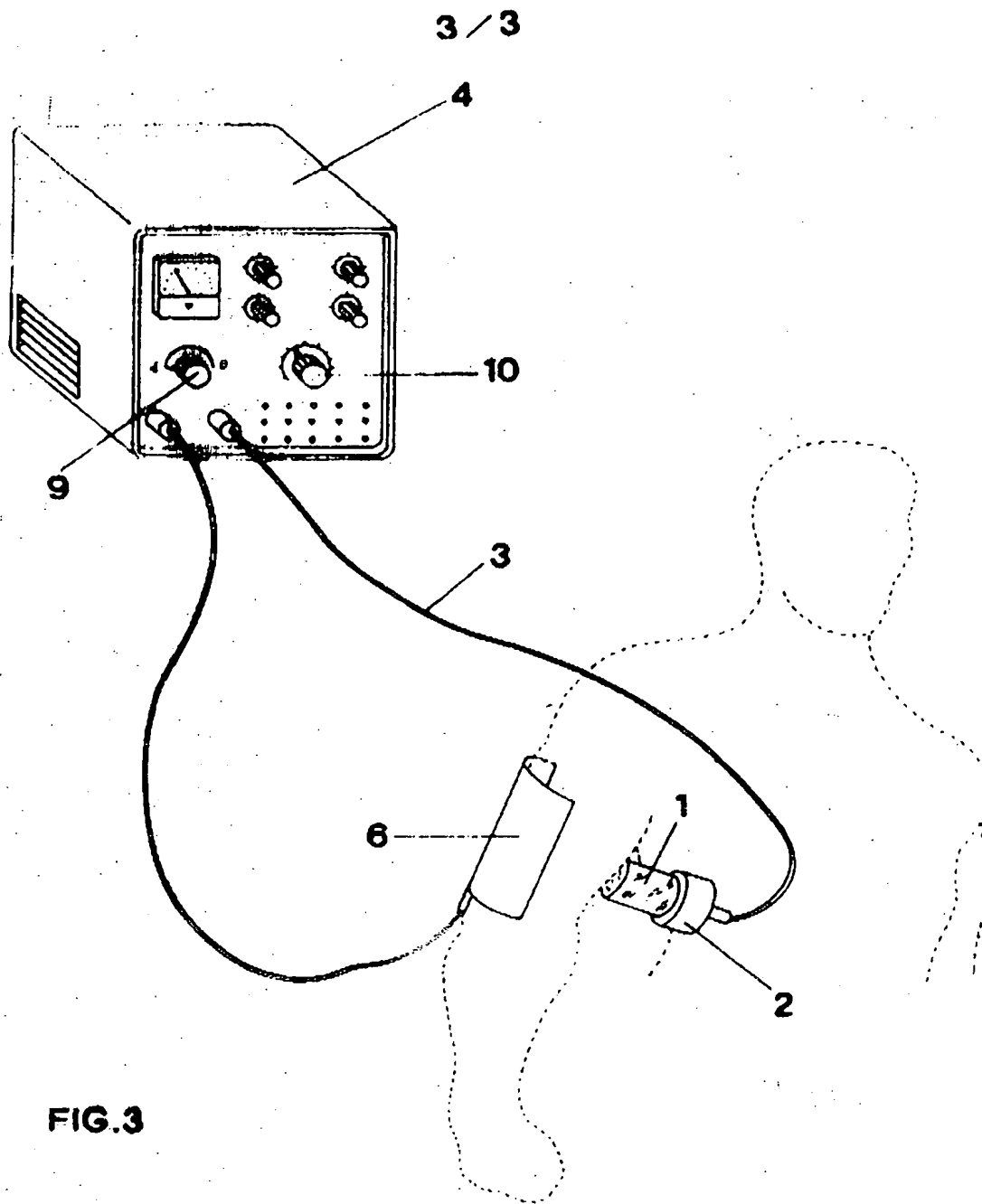


FIG. 2



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